

3.13 Vectors in the Plane my 45pts.

Name _____ Date _____ Period _____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Let \mathbf{u} be the vector represented by the directed line segment \overrightarrow{RS} and \mathbf{v} be the vector represented by the directed line segment \overrightarrow{OP} . Determine if \mathbf{u} and \mathbf{v} are equal.

1) $R = (-4, 7)$, $S = (-1, 5)$, $O = (0, 0)$, and $P = (3, -2)$

$\overrightarrow{RS} = \langle 3, -2 \rangle$ $\overrightarrow{OP} = \langle 3, -2 \rangle$ yes equal

1) _____

2) $R = (2, 1)$, $S = (0, -1)$, $O = (1, 4)$, and $P = (-1, 2)$

$\overrightarrow{RS} = \langle -2, -2 \rangle$ $\overrightarrow{OP} = \langle -2, -2 \rangle$ yes equal

2) _____

Find the component form and magnitude of the indicated vector.

3) Given that $P = (2, 3)$ and $Q = (4, 12)$, find the component form and magnitude of the vector \overrightarrow{PQ} .

$\langle 4-2, 12-3 \rangle = \langle 2, 9 \rangle$

$|\overrightarrow{PQ}| = \sqrt{(2)^2 + (9)^2} = \sqrt{85}$

3) _____

4) Given that $P = (11, 6)$ and $Q = (3, 7)$, find the component form and magnitude of the vector \overrightarrow{QP} .

$\langle 8, -1 \rangle, \sqrt{65}$

4) _____

5) Given that $P = (-2, 7)$ and $Q = (-4, -2)$, find the component form and magnitude of the vector $3\overrightarrow{PQ}$.

$\langle -6, -27 \rangle, 3\sqrt{85}$

5) _____

6) Given that $P = (5, 4)$, $Q = (7, 3)$, $R = (8, 6)$, and $S = (4, 1)$, find the component form and magnitude of the vector $\overrightarrow{PQ} + 3\overrightarrow{RS}$.

$\langle -10, -16 \rangle, 2\sqrt{89}$

6) _____

Find the component form of the indicated vector.

7) Let $\mathbf{u} = \langle -7, -2 \rangle$, $\mathbf{v} = \langle -5, -8 \rangle$. Find $\mathbf{u} + \mathbf{v}$.

$\langle -12, -10 \rangle$

7) _____

8) Let $\mathbf{u} = \langle -2, 9 \rangle$, $\mathbf{v} = \langle 7, 1 \rangle$. Find $\mathbf{u} - \mathbf{v}$.

$\langle -9, 8 \rangle$

8) _____

9) Let $\mathbf{u} = \langle -4, 1 \rangle$, $\mathbf{v} = \langle 5, -3 \rangle$. Find $-3\mathbf{u} + 2\mathbf{v}$.

$\langle 22, -9 \rangle$

9) _____

10) Let $u = \langle 8, -4 \rangle$, $v = \langle -1, 2 \rangle$. Find $2u - v$.

10) _____

$$\langle 17, -10 \rangle$$

Find the unit vector in the direction of the given vector. Write your answer in the indicated form.

11) Let $u = \langle 1, 3 \rangle$. Find the unit vector in the direction of u , and write your answer in component form.

11) _____

$$\left\langle \frac{1}{\sqrt{10}}, \frac{3}{\sqrt{10}} \right\rangle$$

12) Let $u = -3i + 5j$. Find the unit vector in the direction of u , and write your answer in component form.

12) _____

$$\left\langle -\frac{3}{\sqrt{34}}, \frac{5}{\sqrt{34}} \right\rangle$$

13) Let $u = \langle 1, 3 \rangle$. Find the unit vector in the direction of u , and write your answer as a linear combination of the standard unit vectors i and j .

13) _____

$$\frac{1}{\sqrt{10}} i + \frac{3}{\sqrt{10}} j$$

14) Let $u = \langle -5, -1 \rangle$. Find the unit vector in the direction of u , and write your answer as a linear combination of the standard unit vectors i and j .

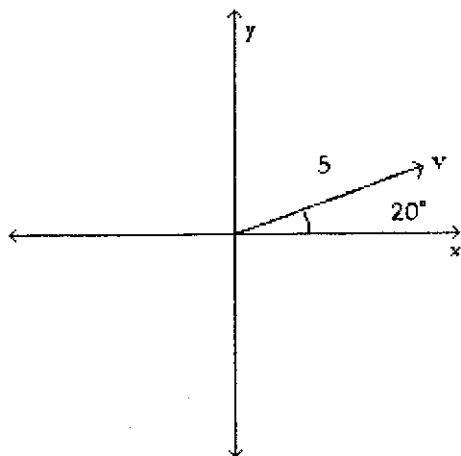
14) _____

$$-\frac{5}{\sqrt{26}} i + -\frac{1}{\sqrt{26}} j$$

Find the component form of the vector v .

15)

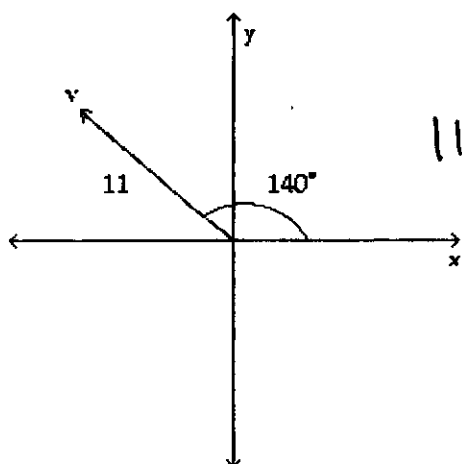
15) _____



$$5 \langle \cos 20^\circ, \sin 20^\circ \rangle$$
$$\langle 4.70, 1.717 \rangle$$

16)

16) _____



$$11 \langle \cos 140^\circ, \sin 140^\circ \rangle$$

$$\langle -8.43, 7.07 \rangle$$

Find the magnitude and direction angle for the following vector. Give the direction angle as an angle in $[0^\circ, 360^\circ)$ rounded to the nearest tenth.

17) $(1, 10)$

17) _____

$$\theta = \tan^{-1}\left(\frac{10}{1}\right) = 84.3^\circ$$

mag. $\sqrt{101}$

18) $-5i + 3j$

18) _____

$$\theta = \tan^{-1}\left(\frac{3}{-5}\right) = -30.96 + 180 = 149^\circ, \sqrt{34}$$

19) $5(\cos 144^\circ i + \sin 144^\circ j)$

19) _____

$$\theta = 144^\circ, 5$$

Solve the problem.

(Making assumption wind pushes plane off course)

20) A plane is heading due south with an airspeed of 211 mph. A wind from a direction of 20) _____

53.0° is blowing at 17.0 mph. Find the bearing of the plane. (Note that bearings are measured from north, clockwise.) Round results to an appropriate number of significant digits.

$$A = \langle 211 \cos 270^\circ, 211 \sin 270^\circ \rangle = \langle 0, -211 \rangle$$

$$W = \langle 17 \cos 37^\circ, 17 \sin 37^\circ \rangle = \langle 13.58, 10.237 \rangle$$

$$A + W = \langle 13.58, -200.77 \rangle$$

$$\theta = \tan^{-1}\left(\frac{-200.77}{13.58}\right) = -86.13^\circ$$

$$90 + 86.13^\circ = 176.13^\circ$$

21) An airplane flies on a compass heading of 90.0° at 220 mph. The wind affecting the plane is blowing from 321° at 48.0 mph. What is the true course and ground speed of the airplane? Round results to an appropriate number of significant digits.

21) _____

$$A = \langle 220 \cos 0^\circ, 220 \sin 0^\circ \rangle = \langle 220, 0 \rangle$$

$$W = \langle 48 \cos 129^\circ, 48 \sin 129^\circ \rangle = \langle -30.21, 37.30 \rangle$$

$$A + W = \langle 189.79, 37.30 \rangle$$

$$|A + W| = 193 \text{ mph}$$

$$\theta = \tan^{-1}\left(\frac{37.3}{189.79}\right) = 11.12^\circ$$

$$90 - 11.12^\circ = 78.88^\circ$$

